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EXAMINER
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DALEY, CLIFTON G

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2609

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/687,179

Applicant(s)

SMITH, DAVID R.

Examiner

Clifton G. Daley

Art Unit

2609

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 10/31/2003.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 300 and 712. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-5, 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. (Hereinafter "Lee"; "DULLRAZOR®: A Software Approach to Hair Removal from Images", 1997, Elsevier Science Ltd., Computers in Biology and Medicine, Vol. 27, No. 6, pp. 533-543).

Regarding **claim 1**, Lee teaches a method for deshadowing a laminographic image comprising: constructing one or more morphological filters using expected sizes of the objects to be imaged (page 536, lines 6-8, i.e. three filter structures based on object thickness and orientation); and applying said filters to a laminographic image including images of said objects (page 536, lines 3-4).

Regarding **claim 2**, Lee teaches the method of claim 1, further comprising: differentiating, after said applying, a background of said image from said images of said objects to remove said background (page 536, lines 13-17).

Regarding **claim 3**, Lee teaches the method of claim 2 further comprising: thresholding an image resulting from said differentiating to provide a binary image of said objects (page 536, lines 17-21).

Regarding **claim 4**, Lee teaches the method of claim 3 further comprising extracting said image resulting from said thresholding to disclose pixels representing said objects (page 536, lines 10-12, i.e. hair mask).

Regarding **claim 5**, Lee teaches the method of claim 1 wherein said morphological filter employs a dilation (page 536, line 13, i.e., a morphological closing, which is by definition a dilation followed by an erosion).

Regarding **claim 12**, Lee teaches the method of claim 1 wherein said morphological filter employs a closing (page 536, line 13).

4. Claims 21, 23 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Loce et al. (Hereinafter "Loce"; US 6297889).

Regarding **claim 21**, Loce teaches a method for deshadowing a laminographic image comprising: selecting a mathematical morphology structuring element larger than examination elements of a laminographic image to be inspected (Column 8, lines 62-63, i.e. structuring element  $K_1$  (Fig. 7) larger than examination element (i.e. hole, column 7, lines 57-58)); performing a mathematical morphological operation on said image (column 8, lines 63-64); and differentiating, after performance of said mathematical morphological operation, a background of said image from said examination elements to remove said background (column 8, lines 63-64).

Regarding **claim 23**, Loce teaches the method of claim 21 wherein said mathematical morphological operation is a closing (column 8, line 64).

Regarding **claim 25**, Loce teaches the method of claim 21 wherein said image is a negative and said mathematical morphological operation is an opening (column 6, lines 50-53, i.e. an opening performed on a negative (background) is disclosed to be equivalent to a closing performed on the original).

5. Claims 41-43 are rejected under 35 U.S.C. 102(b) as being unpatentable over Shih et al. (Hereinafter "Shih"; "Decomposition of Geometric-Shaped Structuring Elements using Morphological Transformations on Binary Images", 1992, Conference

Proceedings, Eleventh Annual International Phoenix Conference on Computers and Communications, pp. 356-363).

Regarding **claim 41**, Shih teaches a method for deshadowing a laminographic image comprising: selecting an ultimate mathematical morphology structuring element radius larger than examination elements of a laminographic image to be inspected (page 357, equation 5, i.e. radius  $i = n$ ); setting an initial slope for said structuring element (page 363, Fig. 3, i.e.  $m_1$ ); setting an initial radius of said structuring element to one (page 357, equation 5, i.e. radius  $i=1$ ); performing a mathematical morphological operation on said image by said set slope to said set radius to achieve a resulting image (page 357, equation 12, i.e. first dilation in the sequence); setting a new slope for said structuring element (page 363, Fig. 3, i.e.  $m_2$ ); increasing the radius of said structuring element (page 363, Fig. 3, i.e. size  $s_2 > s_1$ ); performing a mathematical morphological operation on said resulting image by the new slope to the increased radius to achieve a new resulting image (page 357, equation 12, i.e. second dilation in the sequence); and repeating said setting a new slope, increasing radius, and performing a mathematical morphological operation, on said new resulting image, if the increased radius does not equal said ultimate mathematical morphology structuring element radius (page 357, equation 12, i.e. last dilation is at radius  $i = n$ ).

Regarding **claim 42**, Shih teaches the method of claim 41 wherein said mathematical morphological operation is a dilation (page 357, equation 12).

Regarding **claim 43**, Shih teaches the method of claim 41 wherein said mathematical morphological operation is an erosion (page 357, equation 12).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Segall et al. (Hereinafter "Segall"; "Video tracking using morphological pyramids", 1999, SPIE and IS&T, Journal of Electronic Imaging, April 1999, Vol. 8(2))

Regarding **claim 6**, Lee teaches the method of claim 5. Lee does not teach the method wherein said dilation uses a power of two structuring element.

However, Segall discloses a method wherein dilation uses a power of two structuring element (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the relative size of the structuring element by a factor of 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

Regarding **claim 7**, Lee teaches the method of claim 5. Lee does not teach the method wherein said dilation uses a bi-directional power-of-two structuring element.

However, Segall discloses a method wherein dilation uses a bi-directional (i.e. rows and columns, page 177, right column, lines 34-36) power of two structuring element (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the relative size of the structuring element by a factor of 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

Regarding **claim 8**, Lee teaches the method of claim 5. Lee does not teach the method wherein said morphological filter computes morphological operators such that the area of influence of the structuring element expands in a plurality of directions by up to a power of two during said computation.

However, Segall discloses a method wherein a morphological filter computes morphological operators (page 177, left column, equation 1, i.e. using structuring element K as in page 177, right column, lines 16-22) such that the area of influence of the structuring element expands in a plurality of directions (i.e. rows and columns, page 177, right column, lines 34-36) by up to a power of two during said computation (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the area of influence of the structuring element by a factor of 2).



Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

8. Claims 9-11 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Shih.

Regarding **claim 9**, Lee teaches the method of claim 5. Lee does not teach the method wherein said dilation uses a terraced structuring element.

However, Shih discloses the use of a terraced structuring element (page 363, Fig. 3., i.e. a convex element with  $s_1$  smaller than  $s_2$  smaller than  $s_3$ ).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Shih's method. The motivation to combine being to improve performance.

Regarding **claim 10**, Lee teaches the method of claim 5. Lee does not teach the method wherein said dilation uses a sloped structuring element.

However, Shih discloses the use of a sloped structuring element (page 362, Fig. 1.).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Shih's method. The motivation to combine being to improve performance.

Regarding **claim 11**, Lee combined with Shih, teaches the method of claim 10 above, wherein said dilation uses a smoothly sloped structuring element (Shih: page 362, Fig. 1).

Regarding **claim 15**, Lee teaches the method of claim 1. Lee does not teach the method wherein said morphological filter employs an operation comprising decomposing a structuring element.

However, Shih discloses a method of decomposing a structuring element (page 356, right column, lines 42-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Shih's method. The motivation to combine being to reduce calculations (Shih: page 356, right column, lines 23-24).

Regarding **claim 16**, Lee combined with Shih teaches the method of claim 15 above wherein said morphological filter employs an operation comprising at least one piecewise linear dilation by a structuring element of limited support (Shih: page 356, equation 1, with structuring element  $k$  as in page 363, Fig. 3).

Regarding **claim 17**, Lee combined with Shih teaches the method of claim 15 above wherein said morphological filter employs an operation comprising at least one piecewise linear erosion by a structuring element of limited support (Shih: page 356, equation 2, with structuring element  $k$  as in page 363, Fig. 3).

9. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Fujii et al. (Hereinafter "Fujii"; US 5594768).

Regarding **claim 18**, Lee teaches the method of claim 1. Lee does not teach the method wherein said objects are solder joints.

However, Fujii discloses a processing method wherein the objects are solder joints (Fig. 5, solder joints 25).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Fujii's method. The motivation to combine being to emphasize solder joint locations (column 21, lines 25-27).

Regarding **claim 19**, Lee combined with Fujii teaches the method of claim 18 above wherein said objects are solder joints on a circuit board (Fig. 5, circuit board 14).

Regarding **claim 20**, Lee combined with Fujii teaches the method of claim 18 above wherein a background of said laminographic image are out of focus shadows of said circuit board and components on said circuit board (column 9, lines 39-43).

10. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Cline (US 6058218).

Lee teaches the method of claim 1. Lee does not teach the method wherein said image is a negative and said morphological filter employs an erosion.

However Cline teaches the morphological operation of an erosion on a negative image (column 2, lines 51-53 in view of column 4, lines 22-23, i.e. dilation on an image is equivalent to erosion on the negative (background)).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

11. **Claim 14** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Loce.

Lee teaches the method of claim 1.

Lee does not explicitly teach the method wherein said image is a negative and said morphological filter employs an opening.

However Lee teaches the method wherein said image is an original and said morphological filter employs a closing (page 536, lines 3-8) and Loce discloses that an opening performed on a negative (background) is equivalent to a closing performed on the original (column 6, lines 49-52).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's method with Loce's teaching. The motivation to combine being to improve processing efficiency.

12. Claims 22, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Cline.

Regarding **claim 22**, Loce teaches the method of claim 21. Loce does not teach the method wherein the said morphological operation is a dilation.

However, Cline discloses the morphological operation of a dilation followed by a subtraction (column 2, lines 51-53).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

Regarding **claim 24**, Loce teaches the method of claim 21. Loce does not teach the method wherein the said image is a negative and said morphological operation is an erosion.

However, Cline teaches the morphological operation of an erosion on a negative image (column 2, lines 51-53 in view of column 4, lines 22-23, i.e. dilation on an image is equivalent to erosion on the negative (background)).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

13. Claims 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Cline and further in view of Segall.

Regarding **claim 26**, Loce teaches the method of claim 21. Loce does not teach the method wherein said performing a mathematical morphological operation comprises dilation of said image using power of two structuring element.

However, Cline discloses the morphological operation of a dilation (column 2, lines 51-53).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

Loce combined with Cline do not disclose the morphological operation of dilation using of a power of two structuring element.

However, Segall discloses a method wherein dilation uses a power of two structuring element (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the relative size of the structuring element by a factor of 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified the teaching of Loce combined with Cline with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

Regarding **claim 27**, Loce teaches the method of claim 21. Loce does not teach the method wherein said performing a mathematical morphological operation comprises dilation of said image using a bi-directional power of two structuring element.

However, Cline discloses the morphological operation of a dilation (column 2, lines 51-53).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

Loce combined with Cline do not disclose the morphological operation of dilation using of a bi-directional power of two structuring element.

However, Segall discloses a method wherein dilation uses a bi-directional (i.e. rows and columns, page 177, right column, lines 34-36) power of two structuring element (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the relative size of the structuring element by a factor of 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified the teaching of Loce combined with Cline with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

14. Claims 28 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Segall.

Regarding **claim 28**, Loce teaches the method of claim 21.

Loce does not teach the method wherein said performing a mathematical morphological operation comprises computing morphological operators such that the

area of influence of the structuring element expands in a plurality of directions by up to a power of two during said operation.

However, Segall discloses a method wherein performing a mathematical morphological operation comprises computing morphological operators (page 177, left column, equation 1, i.e. using structuring element K as in page 177, right column, lines 16-22) such that the area of influence of the structuring element expands in a plurality of directions (i.e. rows and columns, page 177, right column, lines 34-36) by up to a power of two during said computation (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the area of influence of the structuring element by a factor of 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loe's teaching with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

Regarding **claim 35**, Loe teaches the method of claim 21.

Loe does not teach the method wherein said performing a mathematical morphological operation comprises computation of morphological operators such that the area of influence of the structuring element expands in each direction by up to a power of two during said computation.

However, Segall discloses a method wherein a morphological filter computes morphological operators (page 177, left column, equation 1, i.e. using structuring



element K as in page 177, right column, lines 16-22) such that the area of influence of the structuring element expands in each direction (i.e. row and column, page 177, right column, lines 34-36) by up to a power of two during said computation (page 177, right column, lines 28-36, i.e. reducing image resolution by a factor of 2 increases the area of influence of the structuring element by a factor of 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's teaching with Segall's method. The motivation to combine being to improve computational efficiency and system robustness (page 182, right column, lines 3-4).

15. Claims 29-31, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Cline and further in view of Shih.

Regarding **claim 29**, Loce teaches the method of claim 21. Loce does not teach the method wherein performing a mathematical morphological operation comprises dilation of said image.

However, Cline discloses the morphological operation of a dilation (column 2, lines 51-53).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

Loce combined with Cline teach the method of claim 21 wherein performing a mathematical morphological operation comprises dilation of said image.

Loce combined with Cline do not disclose the method of claim 21 wherein performing a mathematical morphological operation comprises dilation of said image using a terraced structuring element.

However, Shih discloses a mathematical morphological operation using a terraced structuring element (page 363, Fig. 3., i.e. a convex element with  $s_1$  smaller than  $s_2$  smaller than  $s_3$ ).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified the teaching of Loce, combined with Cline, with Shih's method. The motivation to combine being to improve performance.

Regarding **claim 30**, Loce teaches the method of claim 21. Loce does not teach the method wherein said performing a mathematical morphological operation comprises dilation by a sloped structuring element.

However, Cline discloses the morphological operation of a dilation (column 2, lines 51-53).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's method with Cline's operation. The motivation to combine being to enhance the desired structures (column 2, lines 54-56).

Loce combined with Cline teach the method of claim 21 wherein performing a mathematical morphological operation comprises dilation of said image.

Loce combined with Cline do not disclose the method of claim 21 wherein said performing a mathematical morphological operation comprises dilation by a sloped structuring element.

However, Shih discloses a method of performing a mathematical morphological operation using a sloped structuring element (page 362, Fig. 1).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified the teaching of Loce combined with Cline with Shih's method. The motivation to combine being to improve performance.

Regarding **claim 31**, Loce combined with Cline and Shih teach the method of claim 29 above wherein said structuring element is smoothly sloped (Shih: page 362, Fig. 1).

Regarding **claim 33**, Loce combined with Cline and Shih teach the method of claim 31 wherein said performing a mathematical morphological operation comprises at least one piecewise linear dilation by a structuring element of limited support (Shih: page 356, equation 1, with structuring element  $k$  as in page 363, Fig. 3).

Regarding **claim 34**, Loce combined with Cline and Shih teach the method of claim 31 wherein said performing a mathematical morphological operation comprises at least one piecewise linear dilation by a structuring element of limited support (Shih: page 356, equation 2, with structuring element  $k$  as in page 363, Fig. 3).

16. **Claim 32** is rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Shih.

Loce teaches the method of claim 21.

Loce does not teach the method wherein said performing a mathematical morphological operation comprises decomposing a structuring element.

However, Shih discloses a method of decomposing a structuring element (page 356, right column, lines 42-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Lee's teaching with Shih's method. The motivation to combine being to reduce calculations (page 356, right column, lines 23-24).

17. Claims 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Lee.

Regarding **claim 36**, Loce teaches the method of claim 21.

Loce does not teach the method further comprising thresholding an image resulting from said differentiating to provide a binary image of said objects.

However Lee teaches a mathematical morphological method further comprising thresholding an image resulting from said differentiating to provide a binary image of said objects (page 536, lines 17-21).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's teaching with Lee's method. The

motivation to combine being to enhance automatic segmentation of specific features (Lee: page 534, lines 2-3).

Regarding **claim 37**, Loce combined with Lee teaches the method of claim 36 further comprising extracting said image resulting from said thresholding to disclose pixels representing said objects (Lee: page 536, lines 10-12, i.e. hair mask).

18. Claims 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loce in view of Fujii.

Regarding **claim 38**, Loce teaches the method of claim 21. Loce does not teach the method wherein said examination elements are solder joints.

However, Fujii discloses a method wherein the examination elements are solder joints (Fig. 5, solder joints 25).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Loce's teaching with Fujii's method. The motivation to combine being to emphasize solder joint locations (column 21, lines 25-27).

Regarding **claim 39**, Loce combined with Fujii teaches the method of claim 38 above wherein said solder joints are on a circuit board (Fig. 5, circuit board 14).

Regarding **claim 40**, Loce combined with Fujii teaches the method of claim 39 above wherein said background comprises out of focus shadows of said circuit board and components on said circuit board (column 9, lines 39-43).

19. **Claim 44** is rejected under 35 U.S.C. 103(a) as being unpatentable over Shih in view of Loce.

Shih teaches the method of claim 43. Shih does not teach that the image is a negative.

However Loce discloses a morphological operation on a negative image (column 8, lines 14-16).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have modified Shih's teaching with Loce's disclosure. The motivation to combine being to identify and process particular structures of interest (column 8, lines 23-28).

### ***Conclusion***

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Martins et al. (US 6771834) teaches a mathematical morphology operation for removing shadows from digital images. Baker et al. (US 4926452) discloses a laminographic system for inspecting circuit boards. Lee (US 6463175) discloses a mathematical morphology method for structure-guided feature enhancement. Chanda et al. (Bhabatosh Chanda, Malay K. Kundu and Y. Vani Padmaja, "A MULTI-SCALE MORPHOLOGIC EDGE DETECTOR", 1998, Elsevier Science Ltd., Pattern Recognition Society, Pattern Recognition, Vol. 31, No. 10, 1998, pp. 1469-1478) teaches a morphologic edge detection method using a multi-scale approach. Asano et

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al. (Bhabatosh Chanda, Malay K. Kundu and Y. Vani Padmaja, "A MULTI-SCALE MORPHOLOGIC EDGE DETECTOR", 1998, Elsevier Science Ltd., Pattern Recognition Society, Pattern Recognition, Vol. 31, No. 10, 1998, pp. 1469-1478) discloses the performance advantage of using gray scale structuring elements. Paik et al. (Joonki Paik, Cheolha P. Lee and Mongi A. Abidi, "Image Processing-Based Mine Detection Techniques" A Review", 2002, Plenum Publishing Corp., Subsurface Sensing Technologies and Applications Vol. 3, No. 3, July 2002, pp. 153-202) discloses the use of a terraced structuring element.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Clifton G. Daley whose telephone number is 571-270-3144. The examiner can normally be reached on Monday - Friday 7:30am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander Eisen can be reached on 571-272-7687. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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